

**DR. ANNICK ANCTIL PH.D.**  
ASSISTANT PROFESSOR  
CIVIL & ENVIRONMENTAL ENGINEERING  
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1449 ENGINEERING RESEARCH CENTER - A132  
EAST LANSING MI 48824  
UNITED STATES

**MICHIGAN STATE**  
**UNIVERSITY**

## EXPERTISE

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- Life-cycle assessment and design for the environment with an emphasis on semi-conductor, nanomaterials and fine chemicals production for power generation
- Sustainable energy with an emphasis on photovoltaics
- Multi-criteria optimization
- Nanomaterials synthesis for energy applications
- Industrial ecology and sustainability

## EDUCATION

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### Ph.D. Sustainability

Rochester Institute of Technology (Rochester NY, USA)  
Dissertation: "Fabrication and life cycle assessment of organic photovoltaics"  
GPA: 4.0/4.0

**September 2007 – May 2011**

Advisors: Dr. RP Raffaele  
and Dr. BJ Landi

### Master of Science in Materials Science and Engineering

Rochester Institute of Technology (Rochester NY, USA)  
Thesis: "Nanomaterials for Organic Solar Cells" GPA: 4.0/4.0

**March 2006 – July 2007**

Advisor: Dr. RP Raffaele

### Bachelor degree in Materials Engineering

École Polytechnique de Montréal (Montréal, Canada)

**September 2000 – December 2005**

## APPOINTMENTS AND RESEARCH EXPERIENCE

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### Michigan State University (East Lansing MI, USA)

Assistant Professor, Civil and Environmental Engineering

**August 2014-**

### Clemson University (Clemson SC, USA)

Adjunct Faculty, Environmental Engineering and Earth Sciences

**May 2014 -**

### Clemson University (Clemson SC, USA)

Assistant Professor, Environmental Engineering and Earth Sciences

**August 2012- May 2014**

### Brookhaven National Laboratory (Upton NY, USA)

Research Associate - National Photovoltaics Environmental Research Center

**July 2011 – August 2012**

- Direct Tellurium mining: Resource availability and impact of CdTe PV life-cycle assessment
- Greenhouse gases emissions and energy payback of large photovoltaic power plants in the northeast United States
- Critical Metals in Strategic Photovoltaic Technologies: Abundance versus Recyclability

### NanoPower Research Laboratory (RIT) (Rochester NY, USA)

Research Assistant – Organic Solar Cells

**March 2006 – May 2011**

- Fabrication and characterization of solar cells
- Synthesis and modification of nanomaterials for increased power conversion efficiency
- Life cycle assessment of nanomaterials and organic solar cells

### United Nations Headquarter – DESA (New York NY, USA)

Division for Sustainable Development

**June – August 2009**

### Arkema Research Center, Technical Polymers (King of Prussia PA, USA)

Industrial Internship

**January – September 2005**

**Montreal and McGill University (Montreal, Canada)**  
Undergraduate Research

**May – December 2004**

**QIT – Rio Tinto Research Center (Sorel, Canada)**  
Undergraduate Research Internship

**January- December 2003**

## **CURRENT & PAST FUNDING**

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- Clemson Transformative Initiative for Generating Extramural Research (TIGER)**      **June 2014- June 2015**  
Life-Cycle Assessment of Li-ion Batteries: Increasing Accuracy and Decreasing Bias within Battery Environmental Impact Predictions Co-Pi, \$20,000
- United Nations Headquarter – DESA (New York NY, USA)**      **November 2013- February 2014**  
**Division for Sustainable Development**
- Creation of web interface on integrated sustainable tourism development planning, \$10,000

## **TEACHING**

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### **Clemson University**

*EES8200: Environmental Systems Engineering, Instructor*

*F12-S14*

Graduate level class - Decision making in environmental engineering can be a complex process due to conflicting objectives by various stakeholders, in particular as it relates to economic and social aspects. The course introduces student to fundamental optimization theories required to address complex multi-objective problems encountered in environmental sciences. Application of environmental system approach is presented with real world applications in the area of environmental systems planning, resources conservation, pollution control and sustainability. Multi-criteria decision methods, which provide mathematical methodology to incorporate the values of various stakeholders and technical information to select the best solution for a particular problem, are discussed.

*EES8830-4: Applied Life Cycle Assessment, New course Development and Instructor*

*S13*

Graduate level class - Life-cycle assessment (LCA) is a well-established methodology used to evaluate the environmental impact of a product throughout all the stages of its life, from cradle-to grave. In addition to the most common process LCA methodology, other methods such as input-output, economic and social LCA are introduced.

*EES4860, 6860: Pollution Prevention and Industrial Ecology, Instructor*

*F13*

Undergraduate and graduate level class -Topics include pollution prevention technology, the role of pollution prevention within a corporation, source reduction and recycling, pollution prevention assessments, treatment to reduce disposal, life-cycle assessment, design for environment, industrial ecology.

*EES4900-4: Creative Inquiry, Instructor*

*Undergraduate level class- Using Serious GAMES in Environmental Decision Making*

*S13 - F13*

Contribute to the development, testing, and evaluation of serious games as a tool to enhance environmental and STEM education and understand factors influencing environmental decision-making.

## **ADVISING**

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### **Primary Adviser:**

Collins, Mary Kayla (PhD EE&S Clemson): "Environmental Impacts of Photovoltaics", expected graduation 2016, Co-Adviser

Steele, Muriel (PhD EE&S Clemson): "Integrating algal biofuels with wastewater treatment", expected graduation 2015, Co-Adviser

Serife Elif Can-Sener (PhD Policy Studies Clemson), expected graduation May 2015

Graduated: Tisza, Kata (MS EE&S Clemson): " GIS-Based suitability modeling and multi-criteria decision analysis for utility scale solar plants in four states in the southeast United States" May 2014

### **Dissertation Committee:**

Clemson: Satya, Gubbala (MS EE&S) F12, Aniruddha Sawant (MS EE&S) S14

## PUBLICATIONS

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### Refereed Journal Publications

#### Under Review

Collins MK, **Anctil A**, "Implications for current regulatory waste toxicity characterization methods from analyzing metal and metalloid leaching from photovoltaic modules" (2014)

**Anctil A**, Le Blanc D, "An Educational Simulation Tool for Integrated Coastal Tourism Development in Developing Countries"

#### Published

Steele M, **Anctil A**, Ladner D. "Integrating algaculture into small wastewater treatment plants: Process flow options and life cycle impacts", *Environmental Science: Processes & Impacts* 16 (6), 1387-1399 (2014)

Yilmaz O, **Anctil A**, Karanfil T, "LCA as a Decision Support Tool for Evaluation of Best Available Techniques (BATs) for Cleaner Production", *Journal of Cleaner Production*, In Press (2014)

Ganter M, Landi B, Babbitt C, **Anctil A**, Gaustad G, "Refunctionalization as a Lithium Ion Battery Recycling Alternative", *Journal of Power Sources*, In Press (2014)

**Anctil A**, Fthenakis V, "Critical metals in strategic photovoltaic technologies: abundance versus recyclability", *Progress in Photovoltaics: Research and Applications*, 21 (6), 1253–1259 (2013).

Fthenakis, V, **Anctil A**, "Direct Te mining Resource availability and impact on cumulative energy demand of CdTe PV life-cycles", *IEEE Journal of Photovoltaics*, 3 (1) 433 - 438 (2013).

**Anctil A**, Babbitt, CW, Landi, BJ, Raffaele, RP, "Cumulative Energy Demand for Small Molecule and Polymer Photovoltaics", In Press, *Progress in Photovoltaics: Research and Applications*, 21 (7) 1541-1554 (2013).

**Anctil A**, Babbitt, CW, Landi, BJ, Raffaele, RP, "Material and Energy Intensity of Fullerene Production", *Environmental Science & Technology*. 45 (6), 2353-2359 (2011).

### Book chapter

Anctil, A, Fthenakis, V, "Life-cycle Assessment of Organic Photovoltaics", in *Third generation Photovoltaics*, V. Fthenakis, Editor, 2011.

### Conference Proceedings

(\* Indicates presenter)

Tisza K, Brame S, **Anctil A\***, "GIS based multi-criteria decision analysis for photovoltaic panel deployment in the Southeast United States" *40th IEEE Photovoltaic Specialists Conference*, Denver, CO, June 2014

Collins MK\*, **Anctil A**, "Photovoltaic Waste Characterization with Environmental Considerations" *40th IEEE Photovoltaic Specialists Conference*, Denver, CO, June 2014

Steele M\*, Ladner D, **Anctil A**, "Net Environmental Benefit Approach to Life Cycle Assessment for Algaculture Integration at Wastewater Treatment Plants", *ACLCA Conference*, Tampa Florida October 2013

**Anctil A**, Fthenakis V\*, "Recyclability Challenges in Abundant Material-Based Technologies", *27th EU Photovoltaic European Photovoltaic Solar Energy Conference*, Frankfurt Germany, September 2012.

**Anctil A\***, Fthenakis V, "Greenhouse gases emissions and energy payback of large photovoltaic power plants in the northeast United States", *38th IEEE Photovoltaic Specialists Conference*, Austin, TX, June 2012.

**Anctil A\***, Babbitt CW, Landi, BJ, Raffaele, RP, "Life-cycle Assessment of Organic Solar Cell Technologies", *35th IEEE Photovoltaic Specialists Conference*, Honolulu, HI, June 20-25, 2010. (Best student presentation)

**Anctil A\***, Landi, BJ, Raffaele, RP, "Multi-junction Polymer Solar Cells", *34th IEEE Photovoltaic Specialists Conference*, Philadelphia, PA, June 7-12 2009.

Raffaele, RP\*, **Anctil A**, Merrill, A, Landi, BJ, "Dye-Sensitized Bulk Heterojunction Polymer Solar Cell", *33rd IEEE Photovoltaic Specialists Conference*, San Diego, CA, May 11-16 2008.

**Anctil A\***, Merrill, A, Cress, CD, Landi, BJ, Raffaele, RP, "Environmental Passivation and Temperature Cycling of PCBM - Polymer Solar Cells" *Materials Research Society Fall Meeting*, Boston, MA, November 26-30 2007, Paper H9.54

## Other Presentations

(Primary Student Advisees)

Tisza K, Brame S, Anctil A. "Environmental Impact of Photovoltaics in the Southeast Region" SETAC conference, November 2013

Collins MK, Anctil A. "Characterization and sustainable management of photovoltaic waste", November 2013 (Poster)

Steele MM, Ladner DA, Anctil A. " Net Environmental Benefit Approach to Life Cycle Assessment for Algalculture Integration at Wastewater Treatment Plants", ACLCA Conference, Orlando FL, October 2013

Yilmaz O, Anctil A, Karanfil T. "LCA as a Decision Support Tool for Evaluation of Best Available Techniques (BATs) for Cleaner Production", ACLCA Conference, Orlando FL, October 2013

Collins MK, Anctil A. " Environmental impacts of photovoltaic solar panels at end-of-life", Fall ACS meeting, Indianapolis, IN, September 8-12, 2013

Steele MM, Ladner DA, Anctil A. "Net environmental benefit LCA: Integrating algae at WWTPs." Algal Biomass Biofuels and Bioproducts conference, Toronto, ON, Canada, June 2013. (Poster)

Steele MM, Anctil A, Ladner DA. "Net Environmental Benefit Approach To Life Cycle Assessment For Algal Integration At Wastewater Treatment Plants." South Carolina Environmental Conference, Myrtle Beach, SC, March 2013 (Poster).

Anctil A, Babbitt CW, Landi BJ, Raffaele RP, "Nanomaterials in Organic Solar Cells", Sustainable Nanotechnology Organization Conference, Washington, DC, November 4-6 2012.

Anctil A, Babbitt CW, Landi BJ, Raffaele RP, "Life-cycle Assessment of Fullerenes Production", ACS Summer School on Green Chemistry and Sustainable Energy, Golden, CO, July 21-29, 2010 (Poster)

Anctil A, Merrill, A, Weaver A., Rugg K, Kolev J, Landi, BJ, Raffaele RP, "Inkjet Fabrication of Tandem Dye-Sensitized Bulk Heterojunction Polymer Solar Cells", Materials Research Society Fall Meeting, Boston, MA, December 2 - 5 2008 (Poster)

Anctil A, Landi BJ, Worman J, Raffaele RP, "Colloidal InAs Quantum Dots for Polymer Photovoltaics", Materials Research Society Spring Meeting, San Francisco, CA, April 10-13, 2007 (Poster)

Anctil A, Schauerma, C, Landi, BJ, Raffaele, RP, "Carbon Nanotubes for Polymer Photovoltaics", American Physics Society (APS), Denver, CO, March 5-9, 2007 (Poster)

Anctil A, Evans, C, Raffaele, RP, "Nanomaterials To Improve Quantum Efficiency Of Organic Solar Cells," New Energy New York, Albany, NY, 2006 (Poster)

## INVITED TALKS AND LECTURES

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Keynote Speaker, EcoRep conference 2014 University of South Carolina- *Sustainability* March 2014

Invited Lecturer, Case Western PIRE: Sustainability Life Cycle Analysis Course " Life-Cycle Assessment of Nanomaterials and fine chemicals for Power application", June 2013

Invited Lecturer, Clemson Sustainability Leadership undergraduate course, "Introduction to Life Cycle Assessment", F12, S14

Invited Lecturer, Clemson Renewable Energy Undergraduate course, "Introduction to Photovoltaic" F12

Invited Speaker, Brookhaven National Laboratory, DOE Office of Science Graduate Fellowship annual meeting August 2012

Invited Speaker, RIT Earth Day Seminar, Nanotechnology and Sustainability, April 22 2010

## PROFESSIONAL ACTIVITIES

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### Service to the field

- Editorial Advisory Board, Materials Science in Semiconductor Processing, 2011-
- Reviewer for papers submitted for publication to:
  - Environmental Science and Technology
  - Materials Science in Semiconductor Processing
  - Applied Energy
  - IEEE- Journal of Photovoltaics
  - Progress in Photovoltaics: Research and Applications
  - International Journal of Sustainable Energy
  - Minerals
  - RSC Advances
- Reviewer for project proposals for
  - National Science Foundation (NSF)

- Environmental Protection Agency (EPA) panel
- Department of energy (DOE) panel
- Member of the organizing committee for the 39, 40 and 42 IEEE- Photovoltaics Specialist conference (2012-2014) Awards chair (2013), Graduate Student Assistant Chair (2014), Sub-area chair (2014) and Area chair (2015)
- Reviewer ACLCA (2012-2013) and IEEE-PVSC (2013-2014) conference papers
- Judge for poster competition for the IEEE-PVSC conference (2012/2014), IEEE-ISSST (2012/2014) conference and Clemson Fulbright Symposium (2013)

## Service to the University

### Clemson

- University representative from the college of Engineering and Sciences on the President's Commission on Sustainability, 2012-2014
- Department representative, College of Engineering and Science International Committee, 2013-2014

## HONORS AND AWARDS

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- Best student presentation: 35<sup>th</sup> IEEE Photovoltaics Specialists Conference (2010)
- ACS Summer School on Green Chemistry and Sustainable Energy travel grant award (2010)
- Fonds québécois de la recherche sur la nature et les technologies (FQRNT) Scholarship Program (2007-2010)
- Materials Science and Engineering Program at RIT tuition reimbursement for maintaining a perfect GPA (2006-2007)
- Excellence in Science National Grand Prize (2004)
- American Society for Materials (ASM) school chapter annual prize (2004)

## MEMBERSHIPS

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- Materials Research Society, MRS (2006- )
- Institute of Electrical and Electronics Engineers, IEEE (2009- )
- IEEE Women in Engineering (2012- )
- American Solar Energy Society (2013- )
- South Carolina Solar Council (2013-2014)
- American Center for Life Cycle Assessment, ACLCA (2011- )
- Society for Environmental Toxicology and Chemistry, SETAC (2013- )